

# **Rosemont Copper Project**

## **VISCREEN: Revised Visibility Impact Analysis at Saguaro East National Park**

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## EXECUTIVE SUMMARY

The proposed Rosemont Copper Project (Project) is a new copper project consisting of an open pit copper mine and associated processing facilities that will be located in the Santa Rita Mountains approximately 30 miles southeast of Tucson, Arizona in Pima County. The “*Rosemont Project, Mine Plan of Operations*” was submitted to the Coronado National Forest in July 2007. The Coronado National Forest represents the Federal Land Manager (FLM) for purposes of the Environmental Impact Statement (EIS) that will be prepared for the Rosemont Project.

The Rosemont Project is located between 34.3 and 46.5 kilometers (km) from the extreme boundaries of the Saguaro East National Park Class I area. Class I areas are defined in the Clean Air Act as national parks over 6,000 acres and wilderness areas and memorial parks over 5,000 acres that were established as of 1977. The FLM requested that Rosemont Copper Company (Rosemont) conduct a screening level visibility analysis to evaluate the effects of the emissions from Rosemont's Proposed Mine Plan of Action Scenario (Proposed Action) and four Alternative Scenarios on the Air Quality Related Values (AQRVs) at the Saguaro East National Park. During a conference call on March 14, 2011, the FLM provided recommendations on appropriate assumptions to be made in order to complete this screening level analysis. The chosen screening model was the United States Environmental Protection Agency (EPA)-approved model called VISCREEN. The VISCREEN model has been developed to assess the potential visual air quality impacts of isolated sources that are located less than 50 kilometers (km) from areas of interest.

VISCREEN calculates the potential visual impact of a single “point source”<sup>1</sup> plume of specified emissions under assumed transport and dispersion conditions. Emissions from the Rosemont Project do not originate from a single point source but from numerous point and non-point sources located throughout the Project area. These scattered emissions are inherently much more dilute, and disperse more quickly, than if the same emissions were vented from a single stack. However, VISCREEN requires that the Rosemont Project emission sources must be grouped together for modeling as if they were emitted from a single stack. As a result, VISCREEN presents very conservative results for predicting worst-case visibility impacts from the Project on the Saguaro East National Park.

Visibility modeling was first conducted using VISCREEN and the Level 1 assumptions, followed by modeling using VISCREEN and the Level 2 assumptions<sup>2</sup>. The next step of visibility modeling would be refined Level 2 VISCREEN modeling. However, refined Level 2 VISCREEN modeling was not conducted since VISCREEN is only applicable within 50 km of a source and the virtual point source distance that would be required for conducting the refined Level 2 analysis was estimated to be nearly 75 km.

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<sup>1</sup> For modeling purposes, “point sources” are characterized by emissions that originate from a stack or multiple stacks, or from a process with emissions that can be vented through a stack.

<sup>2</sup> Level 1 and Level 2 screening using VISCREEN differ based on the meteorology used. For Level 1, the emissions (also referred to as the “plume”) are assumed to be located at the area where the visibility is being evaluated, with extremely stagnant air conditions that prevent the plume from dispersing. These extremely stagnant air conditions are assumed to last at least 12 hours which significantly magnifies the visibility impact predicted by the model. This extremely conservative meteorology is referred to as the “hypothetical worst-case” meteorology. For Level 2 evaluation, the actual meteorology from the nearest representative monitor is reviewed. The “actual worst-case” (most stagnant) scenario is identified from the actual meteorology. The meteorology used in the model for Level 2 screening is the most stagnant condition actually observed, which is further assumed to last for at least 12 hours. Stagnant conditions almost never persist for an extended length of time, much less 12 hours, so the Level 2 screening is still a very conservative evaluation of visibility impacts.

The outputs from VISCREEN are compared to standardized thresholds for two parameters,  $\Delta E$  and contrast. These are evaluated at different sun angles and against two different backgrounds, sky and terrain. The first parameter,  $\Delta E$ , represents the perceptibility of a plume on the basis of the color difference between the plume and a viewing background, such as the light-colored sky, or a darker terrain feature. Perception of color and of color differences varies greatly from one individual to another and also varies under different viewing circumstances. The perception of a color difference also varies depending on how well-defined the plume edges are. Sharp-edged plumes are much more perceptible than diffuse-edged plumes. Very narrow and very broad plumes are also more difficult to perceive. The screening threshold for  $\Delta E$  is conservative and is based on a highly perceptible sharp-edged plume. The second VISCREEN parameter, contrast, represents the difference in light intensity between a given object and the surrounding objects that is caused by the plume. Like  $\Delta E$ , contrast is also more perceptible for sharp-edged plumes than for diffuse-edged plumes. However, perception of contrast is less subjective than perception of  $\Delta E$  and as a result it is considered a more meaningful measure of visual impacts.

The worst-case Level 1 VISCREEN modeling, using hypothetical meteorology for the Rosemont Project, indicated slight exceedances of the screening levels for  $\Delta E$  against both sky and terrain backgrounds for all scenarios. Contrast of the plume against the sky background also slightly exceeded the screening levels for all scenarios. Because of these exceedances, Level 2 modeling was conducted.

Modeled visibility impacts were mitigated when applying the still-conservative Level 2 screening inputs. Under the worst-case Level 2 VISCREEN modeling assumptions, plume contrast did not exceed the screening criteria under any scenario. Plume  $\Delta E$  was slightly greater than the screening threshold only for terrain background and when there was forward light scatter (for all scenarios). The screening thresholds represent the upper bound of perceptibility for stack plumes with distinct edges. As indicated above, however, emissions from the Rosemont Project originate from the majority of the mine area. They do not originate from a stack and will not form a distinct plume. The modeled  $\Delta E$  is only slightly above the screening level for a plume with distinct edges. Contrast is below the screening thresholds. Therefore it is highly unlikely that perceptible visual impacts will occur at the Saguaro East National Park due to emissions from the Rosemont Project.

The results of EPA's VISCREEN model were provided for the Proposed Action and the following four Alternatives.

1. Proposed Action
2. Phased Tailings Alternative
3. Barrel Alternative
4. Barrel-Trail Alternative
5. Scholefield-McCleary Alternative

## 1. INTRODUCTION

The proposed Rosemont Copper Project (Project) is a new copper project consisting of an open pit copper mine and associated processing facilities that will be located in the Santa Rita Mountains approximately 30 miles southeast of Tucson, Arizona in Pima County. The “*Rosemont Project, Mine Plan of Operations*” was submitted to the Coronado National Forest in July 2007. The Coronado National Forest represents the Federal Land Manager (FLM) for purposes of the Environmental Impact Statement (EIS) that will be prepared for the Rosemont Project.

The Rosemont Project is located between 34.3 and 46.5 kilometers (km) from the extreme boundaries of the Saguaro East National Park Class I area. Class I areas are defined in the Clean Air Act as national parks over 6,000 acres and wilderness areas and memorial parks over 5,000 acres that were established as of 1977. The FLM requested that Rosemont Copper Company (Rosemont) conduct a screening level visibility analysis to evaluate the effects of the emissions from Rosemont's Proposed Mine Plan of Action Scenario (Proposed Action) and four Alternative Scenarios on the Air Quality Related Values (AQRVs) at the Saguaro East National Park. During a conference call on March 14, 2011, the FLM provided recommendations on appropriate assumptions to be made in order to complete this screening level analysis. The chosen screening model was the United States Environmental Protection Agency (EPA)-approved model called VISCREEN. The VISCREEN model has been developed to assess the potential visual air quality impacts of isolated sources that are located less than 50 kilometers (km) from areas of interest.

VISCREEN calculates the potential visual impact of a single “point source”<sup>3</sup> plume of specified emissions under assumed transport and dispersion conditions. Emissions from the Rosemont Project do not originate from a single point source but from numerous point and non-point sources located throughout the project area. These scattered emissions are inherently much more dilute, and disperse more quickly, than if the same emissions were vented from a single stack. However, VISCREEN requires that the Rosemont Project emission sources must be grouped together for modeling as if they were emitted from a single stack. As a result, VISCREEN presents very conservative results for predicting worst-case visibility impacts from the Project on the Saguaro East National Park.

Rosemont previously submitted (on April 4, 2011) a VISCREEN modeling analysis report titled “*VISCREEN: Visibility Impact Analysis at Saguaro East NP*” that was prepared based upon the recommendations provided by the FLM. Since the prior submittal, Rosemont has re-evaluated its proposed operations. Several changes that reduce emissions from the proposed facility have been made. These changes are described in greater detail in the March 19, 2012 permit application amendment submitted to the Arizona Department of Environmental Quality (ADEQ) titled “*Amendment to: Application for a Class II Permit and Emission Inventory Information Rosemont Copper Project Southeastern Arizona*”. The emission reductions are due to the following significant changes:

- Tier 4 engines will be available for use on six of the haul trucks in lieu of the entire fleet having Tier 2 engines.

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<sup>3</sup> For modeling purposes, “point sources” are characterized by emissions that originate from a stack or multiple stacks, or from a process with emissions that can be vented through a stack.

- The main entry road will be paved (a distance of 3.1 miles). The main plant roads that are not traveled by haul trucks will also be paved.
- Changes to the lime systems, including slaking all lime in two lime slakers that will be controlled by a scrubber, prior to distribution to various processes.
- Seven cartridge filter dust collectors will be installed in lieu of six less-efficient wet scrubbers, and a cartridge filter dust collector will be installed in lieu of the molybdenum dust collector.

Overall, for the Proposed Action the resulting change in the potential to emit for particulate matter less than 10 microns in diameter (PM<sub>10</sub>) for fugitive, non-fugitive, and tailpipe emissions combined is a reduction of 52 tons per year (tpy) in Year 5. For particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>), the combined reduction in fugitive, non-fugitive, and tailpipe emissions is 47 tpy. Facility-wide emissions of oxides of nitrogen (NO<sub>x</sub>) will be reduced by 70 tpy and volatile organic compound (VOC) emissions will be reduced by 6 tpy in Year 5 with the planned operational changes for the Proposed Action. For each of the four Project Alternatives there is some variation in these emission rates, with the modeled emissions for VISCREEN shown in Table 2.1.

This report incorporates the above changes to the operations and the recommendations made by the FLMs for the visibility analysis. The remaining sections of this report present the modeling methodology and results for the Rosemont Project.

### **1.1 Facility Description**

The Rosemont Project includes an open-pit mine and ore processing operations comprised of milling, copper concentrating, copper leaching, and solvent extraction/electrowinning (SX/EW). No copper smelting is included in the Project, nor is any connection to any existing copper smelter under consideration. The production schedule developed from mining sequence plans indicates a Project operating life of approximately 20-25 years using only proven and probable mineral reserves.

Peak mining rates of approximately 115,000,000 tons per year (tpy) of total material (ore and waste) could be anticipated in Year 1. During this year of mining, however, the operation would still be in the development stage. Once full-scale operation has been achieved, such as in Years 2-10, mining rates are expected to be approximately 110,000,000 tpy of total material. Mining rates past Year 10 are expected to taper off during the remaining years of the Project. For modeling purposes, however, the mining rates for Year 2-10 included a 20% capacity factor above the average daily mining capacity.

Mining of the ore will be through conventional open-pit mining techniques including drilling, blasting, loading, hauling and unloading. Waste rock will be transported by haul truck to the waste rock storage areas. Ore will be either transported by haul truck to the leach pad (oxide ore), or crushed and loaded onto a conveyor for transport to the mill (sulfide ore). The copper and molybdenum concentrates from the milling and flotation operations will be shipped off-site for further processing. Except for the alternative referred to as the "Barrel Alternative", oxide ore will be placed on the lined leach pad. Pregnant leach solution (PLS) from the pad will be collected in a solution pond and then processed through the SX/EW plant. Copper cathodes generated from the SX/EW plant will be transported off-site for further processing. For the Barrel Alternative, the SX/EW plant is no longer being proposed; however, emissions

from the SX/EW plant and associated operations have been included in the inventory and modeling. As a result of this change, potential impacts from the Barrel Alternative would be less than reported herein.

## **1.2 Mine Plans**

At the request of the Forest Service, Rosemont's Proposed Mine Plan of Action Scenario (Proposed Action) and four Alternative Scenarios were evaluated as part of this visibility analysis. The following scenarios are under consideration:

1. Proposed Action
2. Phased Tailings Alternative
3. Barrel Alternative
4. Barrel-Trail Alternative
5. Scholefield-McCleary Alternative

For the VISCREEN visibility analysis, the Proposed Action, Barrel Alternative, Barrel-Trail Alternative, and Scholefield-McCleary Alternative were modeled. The Phased Tailings scenario was not modeled for visibility impacts since its footprint is almost identical to the Proposed Action footprint from an air quality perspective. The only variation from the Proposed Action for the Phased Tailings Alternative is the location of the facilities at the plant area, which differ to address geotechnical concerns. Detailed descriptions of all alternatives can be found in the draft EIS (complete document available at [www.rosemontcopper.com](http://www.rosemontcopper.com)).



## 2. EMISSIONS INVENTORY

As recommended by the FLM, only particulate matter emissions from the process sources were considered. Fugitive emissions from the haul trucks and blasting activities were not included. However, NO<sub>x</sub>, primary NO<sub>2</sub>, primary SO<sub>4</sub> and Soot emissions were considered. A NO<sub>2</sub> to NO<sub>x</sub> conversion ratio of 5% was assumed for internal combustion engine-related gaseous emissions. Table 2.1 lists the emission data used for each of the modeled scenarios in this analysis.

<b>Table 2.1 Emissions Used for VISCREEN Analysis</b>				
<b>Emission Species</b>	<b>Emission Rate (lb/hr)</b>			
	<b>Proposed Action</b>	<b>Barrel Alternative</b>	<b>Barrel-Trail Alternative</b>	<b>Scholefield- McCleary Alternative</b>
<b>Particulates</b>	10.86	10.86	10.86	10.86
<b>NO<sub>x</sub> (as NO<sub>2</sub>)</b>	0.88	0.88	0.88	0.88
<b>Primary NO<sub>2</sub></b>	14.7025	14.7020	15.4345	17.1425
<b>Soot</b>	6.5	6.5	6.63	6.93
<b>Primary SO<sub>4</sub></b>	0.02	0.02	0.02	0.02

### 3. METHODOLOGY

The VISCREEN screening level visibility model was used to complete this analysis. VISCREEN is an EPA-recommended screening model for calculating the potential visual impact of a plume of specified emissions under specific transport and dispersion (meteorological) conditions. For the Rosemont Project, VISCREEN was applied in two successive levels of screening (Level 1 and Level 2). The two screening levels differed in the degree of worst-case meteorological conditions used. If Level 1 screening indicates a potential exceedance of the screening criteria, then Level 2 conditions are applied and modeled.

#### 3.1 Level 1 Screening Analysis Results

The Level 1 analysis applies the default hypothetical absolute worst-case meteorological conditions possible in order to calculate the potential worst-case air quality impact on visibility. The hypothetical absolute worst-case meteorological conditions are characterized by a wind speed of 1 meter per second (m/s) and stability criteria rating of "F". Transport of emissions is assumed to place the plume directly adjacent to the observer. Under these conditions, the atmosphere is modeled as being highly stable, with virtually no dispersion of emissions beyond the area being evaluated, with these conditions persisting for 12 hours. In actuality, these conditions occur only with exceptional infrequency and very rarely persist for any period of time.

VISCREEN assumes all emissions are being emitted from a single stack. Default particle characteristics were also assumed. Tables 3.1 through 3.4 show the summarized results of the Level 1 screening on the four modeled scenarios. The full VISCREEN Level 1 inputs and outputs are presented in Appendix A.

The Level 1 screening results indicate possible exceedances of the Sky and Terrain Visibility  $\Delta E$  criteria and a possible exceedance of the Sky Visibility Contrast criteria for each of the scenarios modeled. An evaluation of the actual meteorological data from the Tucson airport's national weather service (NWS) station for 2002 revealed that there were, in fact, no hours with a wind speed of 1 m/s and extremely stable (F) atmospheric conditions. Therefore, a Level 2 analysis was conducted as described in the following section.

The parameters shown in VISCREEN results are as follows:

- Theta (in degrees, °) represents the angle between the sun and the observer's line of sight. If the observer were looking directly at the sun, theta would equal 0°. If the observer were looking away from the sun, theta would equal 180°. The "forward scatter" case represents the sun being in front of the observer with theta equal to 10°. The "backward scatter" case is when the sun is behind the observer with theta equal to 140°.
- The azimuth (Azi in degrees, °) represents the azimuthal angle between the line connecting the source and observer and the observer's line of sight.
- Alpha (in degrees, °) represents the horizontal angle between the observer's line of sight and the plume's centerline.

- For  $\Delta E$  and contrast, “criteria” represent the screening threshold values. These values are the just noticeable difference in perceptibility for a casual observer in the field. Plume  $\Delta E$  and contrast are the VISCREEN output values for the Rosemont Project assuming that there is a distinct plume.

<b>Table 3.1 Level 1 Screening: Proposed Action - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	$\Delta E$		Contrast	
					Criteria	Plume	Criteria	Plume
SKY	10	141	46.5	28	2	1.726	0.05	-0.024
SKY	140	141	46.5	28	2	2.388*	0.05	-0.078*
TERRAIN	10	84	34.3	84	2	4.883*	0.05	0.035
TERRAIN	140	84	34.3	84	2	0.634	0.05	0.007

\*Indicates exceedance of screening criteria, with Level 2 VISCREEN analysis to follow.

<b>Table 3.2 Level 1 Screening: Barrel Alternative - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	$\Delta E$		Contrast	
					Criteria	Plume	Criteria	Plume
SKY	10	141	46.5	28	2	1.726	0.05	-0.024
SKY	140	141	46.5	28	2	2.388*	0.05	-0.078*
TERRAIN	10	84	46.5	84	2	4.883*	0.05	0.035
TERRAIN	140	84	46.5	84	2	0.634	0.05	0.007

\*Indicates exceedance of screening criteria, with Level 2 VISCREEN analysis to follow.

<b>Table 3.3 Level 1 Screening: Barrel-Trail Alternative - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	$\Delta E$		Contrast	
					Criteria	Plume	Criteria	Plume
SKY	10	141	46.5	28	2	1.779	0.05	-0.026
SKY	140	141	46.5	28	2	2.431*	0.05	-0.079*
TERRAIN	10	84	34.3	84	2	4.899*	0.05	0.035
TERRAIN	140	84	34.3	84	2	0.644	0.05	0.007

\*Indicates exceedance of screening criteria, with Level 2 VISCREEN analysis to follow.

<b>Table 3.4 Level 1 Screening: Scholefield-McCleary Alternative - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	ΔE		Contrast	
					Crit	Plume	Crit	Plume
SKY	10	141	46.5	28	2	1.904	0.05	-0.029
SKY	140	141	46.5	28	2	2.529*	0.05	-0.082*
TERRAIN	10	84	34.3	84	2	4.936*	0.05	0.035
TERRAIN	140	84	34.3	84	2	0.668	0.05	0.008

\*Indicates exceedance of screening criteria, with Level 2 VISCREEN analysis to follow.

### 3.2 Level 2 Screening Analysis Results

The Level 2 analysis uses the actual worst-case meteorological conditions for the year 2002 from the Tucson NWS Airport Site. These worst-case actual meteorological conditions were as follows: extremely stable (F) atmospheric conditions, coupled with a wind speed of 2 m/s. During the daylight hours when visibility can be evaluated (typically 6 AM to 6 PM), these conditions appear only for about 303 hours over the course of the entire year. This translates to approximately 3.4% of the hours of the year. Tables 3.5 through 3.8 present the summary results from the Level 2 screening analysis using the actual worst-case meteorological conditions for each of the modeled scenarios. All default particle characteristics were still assumed for this screening. The Level 2 analysis reduces the magnitude of the impacts significantly although it still shows an exceedance of the Terrain ΔE criteria. The full VISCREEN Level 2 inputs and outputs are presented in Appendix A.

<b>Table 3.5 Level 2 Screening: Proposed Action - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	ΔE		Contrast	
					Criteria	Plume	Criteria	Plume
Sky	10	141	46.5	28	2	0.946	0.05	-0.013
Sky	140	141	46.5	28	2	1.3	0.05	-0.043
Terrain	10	84	34.3	84	2	2.527*	0.05	0.017
Terrain	140	84	34.3	84	2	0.315	0.05	0.004

\*Indicates screening criteria exceeded.

<b>Table 3.6 Level 2 Screening: Barrel Alternative - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	ΔE		Contrast	
					Criteria	Plume	Criteria	Plume
Sky	10	141	46.5	28	2	0.946	0.05	-0.013
Sky	140	141	46.5	28	2	1.3	0.05	-0.043
Terrain	10	84	34.3	84	2	2.527*	0.05	0.017
Terrain	140	84	34.3	84	2	0.315	0.05	0.004

\*Indicates screening criteria exceeded.

<b>Table 3.7 Level 2 Screening: Barrel-Trail Alternative - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	ΔE		Contrast	
					Criteria	Plume	Criteria	Plume
Sky	10	141	46.5	28	2	0.975	0.05	-0.014
Sky	140	141	46.5	28	2	1.324	0.05	-0.044
Terrain	10	84	34.3	84	2	2.535*	0.05	0.017
Terrain	140	84	34.3	84	2	0.321	0.05	0.004

\*Indicates screening criteria exceeded.

<b>Table 3.8 Level 2 Screening: Scholefield-McCleary Alternative - Maximum Predicted Worst-Case Visual Impacts Inside the Saguaro East National Park Class I Area</b>								
Background	Theta (°)	Azi (°)	Distance (km)	Alpha (°)	ΔE		Contrast	
					Criteria	Plume	Criteria	Plume
Sky	10	141	46.5	28	2	1.044	0.05	-0.016
Sky	140	141	46.5	28	2	1.378	0.05	-0.046
Terrain	10	84	34.3	84	2	2.554*	0.05	0.018
Terrain	140	84	34.3	84	2	0.333	0.05	0.004

\*Indicates screening criteria exceeded.

#### 4. VISCREEN RESULTS ANALYSIS

As a point source emission model, VISCREEN treats all emissions as if they were emitted from a single stack. However, almost all of the emissions from the Rosemont Project are emitted from volume sources. These are sources that are dispersed across many acres of land area. Emissions are not from a stack. The Rosemont Project sources are located throughout the below-ground surface level mine and across the ground surface level process area. However, due to the nature of the mathematical algorithms used to conduct visibility modeling, emissions from a myriad of sources must be combined as if they were emitted from a single stack and then entered into the model. While this is the generally-accepted screening approach for modeling these types of sources, it does produce highly conservative model results.

Modeled visibility impacts were mitigated when applying the still-conservative Level 2 screening inputs. Under the worst-case Level 2 VISCREEN modeling assumptions, plume contrast did not exceed the screening criteria under any scenario. Plume  $\Delta E$  was slightly greater than the screening threshold only for terrain background and when there was forward light scatter (for all scenarios). The screening thresholds represent the upper bound of perceptibility for stack plumes with distinct edges. Emissions from the Rosemont Project, however, originate from the majority of the mine area. They do not originate from a stack and will not form a distinct plume. The modeled  $\Delta E$  is only slightly above the screening level for a plume with distinct edges. Contrast is below the screening thresholds. Therefore it is highly unlikely that perceptible visibility impacts will occur when considering the very dispersed nature of actual emissions from the Rosemont Project.

The Level 1 and Level 2 screening approaches with VISCREEN represent worst-case scenarios, with Level 1 modeling the hypothetical absolute worst-case meteorological conditions along with worst-case default settings and highest short-term emission rates. Level 2 VISCREEN modeling substitutes the actual worst-case meteorological conditions for the hypothetical worst-case meteorological conditions, however, the remaining worst-case default assumptions remain. A somewhat more realistic evaluation of the visibility impacts calculated for the Level 2 screening analysis can be obtained by conducting a refined Level 2 analysis.

A refined Level 2 analysis involves representing the emission source in VISCREEN as a “virtual point source”. This representation is made by estimating the distance to which the point source must be moved *further away from* the receptors of interest (i.e., those within Saguaro East National Park) in order for the plume dispersion at the source to be equal to width of all emission units comprising the source. Since the Rosemont Project primarily consists of a number of volume sources that are spread out across many acres of land as described previously, the virtual point source distance becomes rather large. Indeed, the virtual point source distance was estimated to be 73.5 km. Since the VISCREEN model can only be used for a maximum distance of 50 km from the source to Class I Area, the consensus among the Forest Service and National Park Service representatives was not to conduct the refined analysis. Model results would not be considered valid. Consequently, this analysis was not conducted and the Level 2 screening model results are understood to be very conservative estimates.

**APPENDIX A**  
**VISCREEN INPUTS AND OUTPUTS**

## LEVEL 1 SCREENING - Proposed Action

Visual Effects Screening Analysis for  
Source: Rosemont  
Class I Area: Saguaro East

\*\*\* Level-1 Screening \*\*\*

Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	14.70	LB /HR
Soot	6.50	LB /HR
Primary SO4	.02	LB /HR

\*\*\*\* Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

### R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
Screening Criteria ARE Exceeded

						Delta E	Contrast	
						=====	=====	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
=====	=====	====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	1.726	.05	-.024
SKY	140.	141.	46.5	28.	2.00	2.388*	.05	-.078*
TERRAIN	10.	84.	34.3	84.	2.00	4.883*	.05	.035
TERRAIN	140.	84.	34.3	84.	2.00	.634	.05	.007



**LEVEL 1 SCREENING - Barrel Alternative**

Visual Effects Screening Analysis for  
 Source: Rosemont  
 Class I Area: Saguaro East

\*\*\* Level-1 Screening \*\*\*  
 Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	14.70	LB /HR
Soot	6.50	LB /HR
Primary SO4	.02	LB /HR

\*\*\*\* Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
 Screening Criteria ARE Exceeded

Backgrnd	Theta	Azi	Distance	Alpha	Delta E		Contrast	
					Crit	Plume	Crit	Plume
=====	=====	====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	1.726	.05	-.024
SKY	140.	141.	46.5	28.	2.00	2.388*	.05	-.078*
TERRAIN	10.	84.	34.3	84.	2.00	4.883*	.05	.035
TERRAIN	140.	84.	34.3	84.	2.00	.634	.05	.007

## LEVEL 1 SCREENING - Barrel-Trail Alternative

Visual Effects Screening Analysis for  
Source: Rosemont  
Class I Area: Saguaro East

\*\*\* Level-1 Screening \*\*\*  
Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	15.43	LB /HR
Soot	6.63	LB /HR
Primary SO4	.02	LB /HR

\*\*\*\* Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

### R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
=====	=====	====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	1.779	.05	-.026
SKY	140.	141.	46.5	28.	2.00	2.431*	.05	-.079*
TERRAIN	10.	84.	34.3	84.	2.00	4.899*	.05	.035
TERRAIN	140.	84.	34.3	84.	2.00	.644	.05	.007

**LEVEL 1 SCREENING - Scholefield-McCleary Alternative**

Visual Effects Screening Analysis for  
 Source: Rosemont  
 Class I Area: Saguaro East

\*\*\* Level-1 Screening \*\*\*  
 Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	17.14	LB /HR
Soot	6.93	LB /HR
Primary SO4	.02	LB /HR

\*\*\*\* Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
 Screening Criteria ARE Exceeded

Backgrnd	Theta	Azi	Distance	Alpha	Delta E		Contrast	
					Crit	Plume	Crit	Plume
=====	=====	====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	1.904	.05	-.029
SKY	140.	141.	46.5	28.	2.00	2.529*	.05	-.082*
TERRAIN	10.	84.	34.3	84.	2.00	4.936*	.05	.035
TERRAIN	140.	84.	34.3	84.	2.00	.668	.05	.008

## LEVEL 2 SCREENING - Proposed Action

Visual Effects Screening Analysis for  
Source: Rosemont  
Class I Area: Saguaro East

\*\*\* User-selected Screening Scenario Results \*\*\*

Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	14.70	LB /HR
Soot	6.50	LB /HR
Primary SO4	.02	LB /HR

### PARTICLE CHARACTERISTICS

	Density	Diameter
	=====	=====
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

### Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	2.00 m/s

## R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
Screening Criteria ARE Exceeded

					Delta E	Contrast		
					=====	=====		
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
=====	=====	=====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	.946	.05	-.013
SKY	140.	141.	46.5	28.	2.00	1.300	.05	-.043
TERRAIN	10.	84.	34.3	84.	2.00	2.527*	.05	.017
TERRAIN	140.	84.	34.3	84.	2.00	.315	.05	.004

## LEVEL 2 SCREENING - Barrel Alternative

Visual Effects Screening Analysis for  
Source: Rosemont  
Class I Area: Saguaro East

\*\*\* User-selected Screening Scenario Results \*\*\*

Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	14.70	LB /HR
Soot	6.50	LB /HR
Primary SO4	.02	LB /HR

### PARTICLE CHARACTERISTICS

	Density	Diameter
	=====	=====
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

### Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	2.00 m/s

## R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
Screening Criteria ARE Exceeded

					Delta E	Contrast		
					=====	=====		
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
=====	=====	=====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	.946	.05	-.013
SKY	140.	141.	46.5	28.	2.00	1.300	.05	-.043
TERRAIN	10.	84.	34.3	84.	2.00	2.527*	.05	.017
TERRAIN	140.	84.	34.3	84.	2.00	.315	.05	.004

## LEVEL 2 SCREENING - Barrel-Trail Alternative

Visual Effects Screening Analysis for  
Source: Rosemont  
Class I Area: Saguaro East

\*\*\* User-selected Screening Scenario Results \*\*\*

Input Emissions for

Particulates	10.86	LB /HR
NOx (as NO2)	.88	LB /HR
Primary NO2	15.43	LB /HR
Soot	6.63	LB /HR
Primary SO4	.02	LB /HR

### PARTICLE CHARACTERISTICS

	Density	Diameter
	=====	=====
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

### Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	2.00 m/s

## R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
Screening Criteria ARE Exceeded

					Delta E	Contrast		
					=====	=====		
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
=====	=====	=====	=====	=====	=====	=====	=====	=====
SKY	10.	141.	46.5	28.	2.00	.975	.05	-.014
SKY	140.	141.	46.5	28.	2.00	1.324	.05	-.044
TERRAIN	10.	84.	34.3	84.	2.00	2.535*	.05	.017
TERRAIN	140.	84.	34.3	84.	2.00	.321	.05	.004

## LEVEL 2 SCREENING - Scholefield-McCleary Alternative

Visual Effects Screening Analysis for  
 Source: Rosemont  
 Class I Area: Saguaro East

\*\*\* User-selected Screening Scenario Results \*\*\*

Input Emissions for

Particulates	10.86	LB	/HR
NOx (as NO2)	.88	LB	/HR
Primary NO2	17.14	LB	/HR
Soot	6.93	LB	/HR
Primary SO4	.02	LB	/HR

### PARTICLE CHARACTERISTICS

	Density	Diameter
	=====	=====
Primary Part.	2.5	6
Soot	2.0	1
Sulfate	1.5	4

### Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	250.42 km
Source-Observer Distance:	34.31 km
Min. Source-Class I Distance:	34.31 km
Max. Source-Class I Distance:	46.46 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	2.00 m/s

## R E S U L T S

Asterisks (\*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area  
 Screening Criteria ARE Exceeded

	Theta	Azi	Distance	Alpha	Crit	Delta E Plume	Contrast Crit	Plume
	=====	=====	=====	=====	=====	=====	=====	=====
Backgrnd	10.	141.	46.5	28.	2.00	1.044	.05	-.016
SKY	140.	141.	46.5	28.	2.00	1.378	.05	-.046
TERRAIN	10.	84.	34.3	84.	2.00	2.554*	.05	.018
TERRAIN	140.	84.	34.3	84.	2.00	.333	.05	.004